Province of British Columbia

Northwest Economic Development Studies

Summary Report

Cabinet Committee on Economic Development
THE HONOURABLE R.H. McCLELLAND, MINISTER

LEGISLATIVE LIBRARY
VICTORIA, B.C.
34V

EXECUTIVE SUMMARY

TASK FORCE ON NORTHWEST ECONOMIC DEVELOPMENT OPPORTUNITIES

Regional and Resource Analysis Branch
Ministry of Industry and Small Business Development

September 1983

Canadian Cataloguing in Publication Data

Main entry under title:
Executive summary

(Northwest economic development studies, ISSN 0822-6857)

Cover title: Summary report.
"Task Force on Northwest Economic Development Opportunities".
ISBN 0-7719-9339-0

1. British Columbia - Economic conditions - 1945- * I. British Columbia. Ministry of Industry and Small Business Development. Regional and Resource Analysis Branch. II. British Columbia. Cabinet Committee on Economic Development. III. Task Force on Northwest Economic Development Opportunities (B.C.) IV. Series.

HC117.B7E98 1983 330.9711'32'04 C83-092299-7

PREFACE

During late 1981 and early 1982 the Cabinet Committee on Economic Development made a series of fact-finding visits to Northwest British Columbia. In response to briefs presented by a large number of private citizens, corporations and public groups, the Cabinet Committee commissioned a report which would summarize the area's economic potential. That report "The Northwest Region, A British Columbia Regional Economic Study" was released on September 15th, 1982.

The September 1982 report states that the area north of the Highway 16/CNR northline corridor has substantial development potential based mainly upon the significant but largely undeveloped mineral resources. However, this area lacks virtually all of the necessary infrastructure to sustain early large scale development. Lack of transportation and municipal facilities and adequate power at reasonable cost are seen as significant constraints to development at the present time. The report noted that development of minerals and other resources will require substantial private and public investments - investments which can only be made after careful planning and consideration of alternatives.

In response to the September 1982 report, the Cabinet Committee on Economic Development directed an Inter-Ministry Task Force to begin work on a series of detailed studies on the northern part of the Northwest region (i.e. from Stewart to the Yukon border). These studies were undertaken to determine the scale and timing of potential mineral developments, and to identify options to supply power, transportation and community infrastructure in order to serve those developments. The Task Force was also asked to identify the social and environmental issues which might arise as development proceeds.

The product of these studies is a set of six Inter-Ministry Task Force reports plus a summary report which includes the findings of these six background studies. It should be emphasized that these studies do not represent a blueprint for development, but rather indicate priorities for future planning and development. The reports identify options and, as far as possible, the negative and positive factors associated with each option. Final decisions on any specific development options would be premature at this stage. Such decisions will have to await further analysis and more concrete private sector proposals for the development of the resources of the region.

Finally, it should be noted that during the course of these studies the mine development scenarios were refined as more information became available. These scenarios have been updated in the background reports where possible. However, in the power supply report and the transportation report, the analysis is based on the original hypothetical development scenario. The environmental overview report is based upon the early definitions of potential development options provided by the other working groups. The conclusions of these reports are not materially altered by the refined development scenario.

TABLE OF CONTENTS

Chapter	Title	Page
Preface		i
Chapter 1	Introduction	1
Chapter 2	Potential Mine Development ..... in Northwest British Columbia	3
Chapter 3	Transportation Options	8
Chapter 4	Energy Options	19
Chapter 5	Settlement Options	25
Chapter 6	Social Implications	31
Chapter 7	Environmental Implications	34
Chapter 8	Conclusions	37

1. INTRODUCTION

In the area north of Stewart to the British Columbia/ Yukon border and west of the incomplete Dease Lake extension, there are currently nine operating mines. Most of these are relatively small, extracting precious metals such as silver and gold. Fully 800 of the estimated 1,000 person mine workforce in the area are employed at the Cassiar asbestos and Granduc copper mines. Cassiar alone accounts for 600 of this total.

In terms of further potential, there are 23 known significant, but undeveloped, mineral deposits in the region. As with the existing mines, many of these represent limited potential, with projected mine workforces as low as 20 persons and projected mine lives of only 2 to 3 years. However, nine of these deposits stand out from the rest. Based upon currently known and inferred reserves and ore grades, these properties may have the potential to support large scale mines in the region. Some of these deposits could require workforces in excess of 1,000 persons and could generate large quantities of output for the market over an extended period of time. These properties will all require major investments at the minesites and in municipal, transportation and electric power infrastructure prior to development.

The planning studies undertaken over the last several months have concentrated on these nine "cornerstone" properties. A hypothetical production scenario for the nine properties was developed after discussions with industry and government agencies.

The properties examined and their principle minerals are shown below:

Property	Products
Kutcho Creek	- copper, zinc
Adanac	- molybdenum
Letain	- asbestos
Red Chris	- copper
Mount Klappan	- anthracite
Schaft Creek	- copper
Eaglehead	- copper
Sustut	- copper
Stikine	- copper

Each property was evaluated in more detail to assess further the accuracy of the projected timing and scale of the development. The findings of this analysis are summarized in Chapter 2 "Potential Mine Development in Northwest British Columbia".

Transportation, energy and settlement options for these nine mines were examined. The results of these studies are summarized in Chapters 3 (Transportation), 4 (Energy) and 5 (Settlement). Finally, the potential social and environmental issues associated with development in the Northwest have been addressed. The results of these assessments are summarized in Chapters 6 and 7 respectively.

2. POTENTIAL MINE DEVELOPMENT IN NORTHWEST BRITISH COLUMBIA

Table 2.1 lists nine major mineral properties in northwest British Columbia. The potential scale and life of each mine was estimated after consultation with the developers and on the basis of information available to the Ministry of Energy, Mines and Petroleum Resources. After this, studies were undertaken to estimate, on a preliminary basis, the capital investment required to bring each property into production. Further studies estimated the operating cost for each potential mine/mill complex. Finally, a detailed evaluation of future market prospects was undertaken for the major minerals in northwest British Columbia. On this basis, an optimistic and a pessimistic range of prices was projected for selected years up to the year 2000. Given the estimated capital and operating costs for each mine/mill complex and the projected mineral prices, the financial viability of each prospect at different time periods was analyzed.

This analysis indicates that Kutcho Creek, Stikine and Mount Klappan are the prospects most likely to become viable mines towards the end of the 1980's or early in the 1990's. Kutcho Creek is a copper and zinc prospect with significant silver by-product values. The outlook for zinc markets is reasonably promising over the next two decades and this is a factor favouring the project. Mount Klappan is a deposit of anthracite coal under very active exploration at the present time. The developer has determined that the deposit could be mined by low cost, open pit methods. Virtually all other deposits of anthracite in the world are extracted through higher cost, underground operations. Also, much of current world production capacity is in older coal mines with relatively high-cost archaic equipment and methods. A major constraint to this large project is the limited size of the world market for anthracite coal. Considerable effort will be required in market

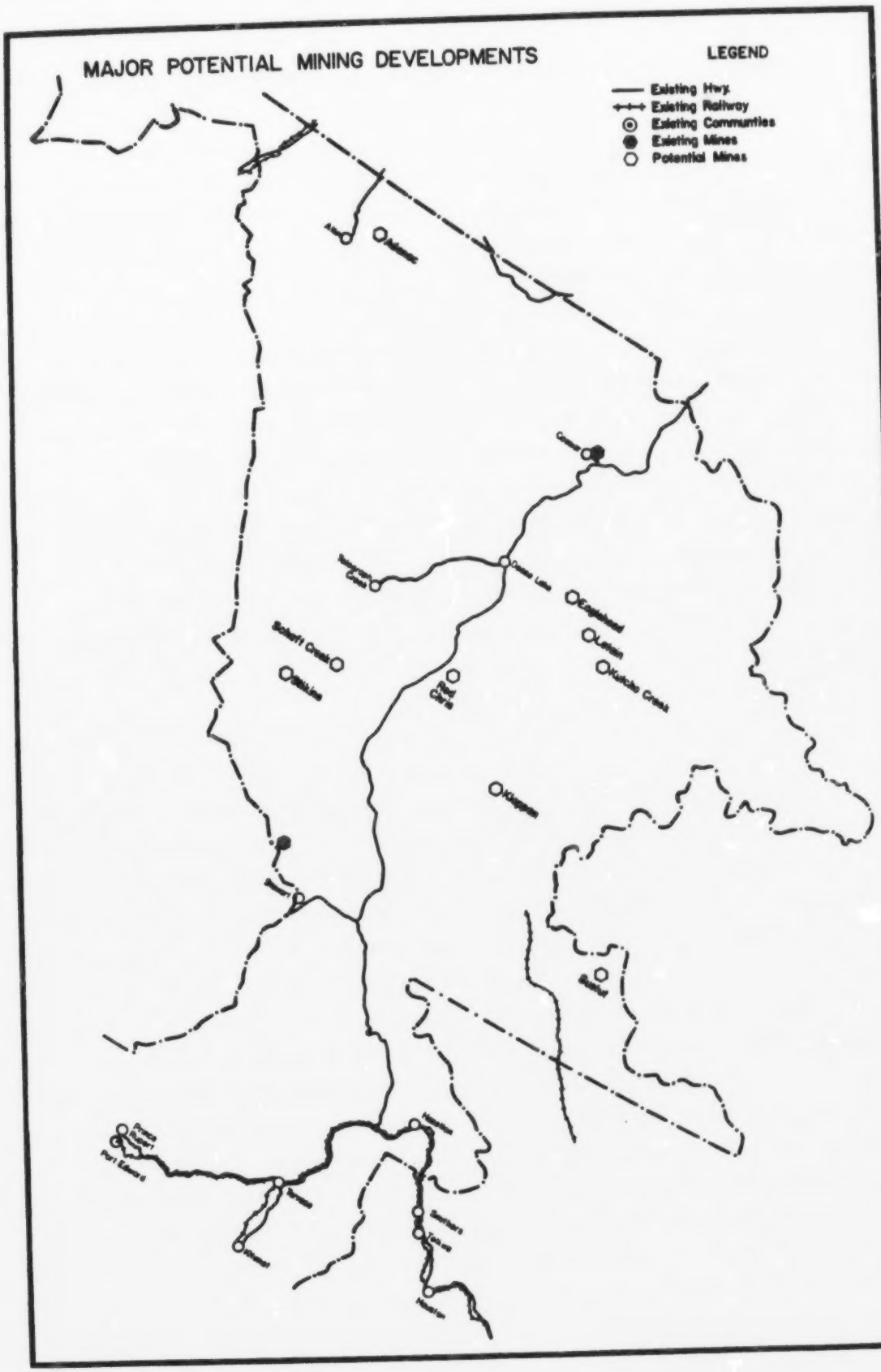

MAJOR POTENTIAL MINING DEVELOPMENTS
LEGEND
Existing Hwy.
Existing Railway
Existing Communities
Existing Mines
Potential Mines

Table 2.1
Major Potential Mines

Property	Company	Products	Estimated Concentrate Output* (tonnes per year)	Estimated Production Workforce*	Estimated Mine Life (years)	Probability of Proceeding Prior to 1990	Probability of Proceeding Prior to 2000
Kutcho Creek	Esso Resources Ltd. & Sumitomo Mining	Copper Zinc Silver	138,000	450	11	medium	high
Mt. Klappan	Gulf Canada Resources Ltd.	Anthracite Coal	5,000,000	1250	20	medium	high
Stikine	Stikine Copper Ltd.	Copper Silver Gold	303,000	450	20	low	medium/high
Schaft Creek	Teck Corp.	Copper Molybdenum Silver Gold	318,000	1200	25	low	medium
Eaglehead	Esso Resources Ltd.	Copper Molybdenum Silver Gold	39,000	250	15	low	medium
Sustut	Falconbridge	Copper	55,000	350	8	low	low/medium
Red Chris	Kidd Creek Mines Ltd.	Copper Gold	24,000	375	20	low	low
Adanac	-	Molybdenum	5,000	320	31	low	low
Letain	Brinco Mining Ltd.	Asbestos	24,000	350	15	low	low

* at full capacity.

development. However, good potential exists for access to the South Korean market by the late 1980's and other promising opportunities exist in Europe and elsewhere in S.E. Asia.

From a strict perspective of mine head costs, the Stikine property would be an attractive prospect for development in the late 1980's or early 1990's time frame. Stikine is a deposit of relatively high grade (approximately 1%) copper with very significant precious metal by-product potential. Unfortunately, there are a number of substantial technical problems with this prospect which may delay development. In particular, access to the deposit is exceptionally difficult and could require major tunnelling. Also, the deposit is located near glaciers, implying very difficult working conditions. The richness of the deposit is such that great incentives exist to overcome these problems, but overall, development appears unlikely prior to the late 1990's.

Schaft Creek is a very large, low grade copper/ molybdenum deposit that could support a mine as large as the present Lornex mine in the Highland Valley. There is a low probability of this project reaching production by the late 1980's or early 1990's but a medium probability prior to the year 2000. The potential for precious metal by-products in this deposit is relatively low, and the prospects for the molybdenum market are very pessimistic over at least the next 10 years. As a consequence, the timing of this project is almost entirely dependent on trends in the copper market. The prospects here are mixed. Although all analysts agree that prices will rise from their current cyclical lows, the extent and duration are subject to considerable debate.

Eaglehead is another copper/molybdenum prospect but with a much smaller potential than Schaft Creek. Both the copper and precious metal by-product grades of this deposit are somewhat higher than Schaft Creek but they are still not exceptional. Virtually the same considerations apply to Eaglehead as to Schaft

Creek. However, due to the smaller size of the deposit, unit operating costs will be considerably higher and only partially offset by the lower capital investment required to bring this prospect to production. Only under relatively optimistic market assumptions will this prospect reach production prior to the year 2000.

Sustut is a relatively high grade copper prospect (in excess of 1%) but with no precious metal or other by-product potential. The indications are that Sustut will only reach production prior to the year 2000 under very optimistic market assumptions.

The other potential major mines in the region have a low probability of reaching production prior to the year 2000. Perhaps most surprising of these is Adanac, a large molybdenum deposit near Atlin. This prospect was very near a production decision in 1980. Unfortunately, the market prospects for molybdenum, as mentioned earlier, are universally gloomy for at least the next 10 years. The industry currently suffers from gross excess capacity and there are a number of very large and low cost prospects in other areas of the world which will probably be developed prior to Adanac. Molybdenum prices will likely remain too low to justify a production decision for a considerable time period.

Red Chris copper is another relatively low grade (less than 1%) copper deposit with low precious metal by-products. The projected scale of the operation is such that relatively high unit costs would require very high copper prices prior to a production decision. Finally, the Letain prospect is a potential asbestos mine. The problem here arises from the fact that the product grade is considerably lower than at Cassiar. Also, the markets for asbestos are uncertain. Development of Letain will probably require a significant advance in asbestos prices and development will likely await depletion of the Cassiar mine.

The above findings are, of course, subject to a number of qualifications. For example, if the public sector were to absorb an increased percentage of infrastructure costs, then the financial viability of the prospects would be altered. Also, further exploration activities at the nine major properties may define greater ore reserves or improved ore grades which could substantially change the viability of the prospects by increasing projected revenues, increasing the scale of operations or extending the mine life. Similarly, through exploration, a number of apparently minor properties, based on present knowledge, could reach a higher potential. As a specific example, exploration work, performed in 1982 by Falconbridge Copper Ltd., on the Windy Craggy prospect, delineated substantially increased reserves of copper and cobalt. In short, there is considerable uncertainty regarding the timing and extent of development which cannot be avoided.

It should also be noted that these studies recognize that as a result of resource depletion and changing economic conditions, mines in the region will inevitably close over the course of the study period. The implications of such closures would have to be dealt with on a case by case basis.

Finally, there are several precious metal deposits throughout the northwest which will add to the region's overall development potential. In fact, several precious metal mines such as Scottie gold (near Stewart), Baker Lake gold in the Toodoggone region and Erickson and Hanna gold near Cassiar, are already operating and contributing significantly to employment in the region. Given the significant cycles in precious metal prices, the difficulty in predicting project timing and the small scale of many of these prospects, it was decided to omit these potential mines from this analysis.

3. TRANSPORTATION OPTIONS

The objective of the transportation study was to identify the least-cost alternatives from a number of options for transporting mineral products from potential mines in Northwest British Columbia to tidewater.

Capital costs for upgrading the existing road and rail systems and constructing new transportation alternatives were estimated on a preliminary basis. Operating and maintenance costs were also estimated for each alternative transportation mode and route.

The costs for each alternative case were compared from two perspectives, namely: 1) the least cost to the economy and 2) the least cost to the shipper of the commodity.

The transportation alternatives that were analyzed are described below.

Case 1: Base Case

i) Minerals from Kutcho, Letain, Red Chris, Schaft Creek, Eaglehead, Sustut and Stikine would be hauled by road, to either the port of Stewart or Prince Rupert.

ii) Minerals from Adanac would be taken by air or road and rail to Skagway for export. As their transportation would not impact on the Highway 37 corridor, transportation cost estimates have not been included in this analysis.

iii) Coal from Mount Klappan would be hauled by rail to the port of Prince Rupert for export. Four alternative routes from Mount Klappan to the CNR were considered - via Prince George, via Vanderhoof, via Hazelton and via Meziadan to Terrace. An access road for employee transportation would also be required for the Mount Klappan coal property.

Case 2: BCR Extension From Mount Klappan to Dease Lake

This case considers an extension of the BCR from Mount Klappan to Dease Lake, a distance of 190 kilometres (118 miles). Mount Klappan coal would continue to be transported as above. Minerals from five potential mines in the region (Kutcho, Letain, Eaglehead, Red Chris and Sustut) could then be transported via rail.

Case 3: Construction of a Rail Route from Dease Lake to Stewart

This case considers the construction of a new rail link to Stewart via Meziadin from the BCR extension. This would provide an alternative to the road options of Case 1 and the previously described rail alternatives.

Relative to the previous case, this railway would reduce the haul distance for Mount Klappan to tidewater and provide a rail option for the transportation of minerals from five potential mines in the region to Stewart.

Case 4: Construction of a Coal Slurry Pipeline from Mount Klappan to Stewart

This case considers the construction of a coal slurry pipeline from Mount Klappan via a similar route to the railway considered in Case 3. It is assumed that minerals would be hauled by road to either Stewart or Prince Rupert, as per Case 1, the base case.

In addition to these cases (which assume 5 million tonnes of coal from Mount Klappan), the transportation of one million tonnes of coal per year, by road, between Mount Klappan and Stewart was also investigated.

Total Public and Private Transportation Costs

The approach taken to estimate total public and private costs did not involve a full benefit-cost approach since this study is intended to be only a "pre-feasibility analysis" of transportation options in Northwest B.C.

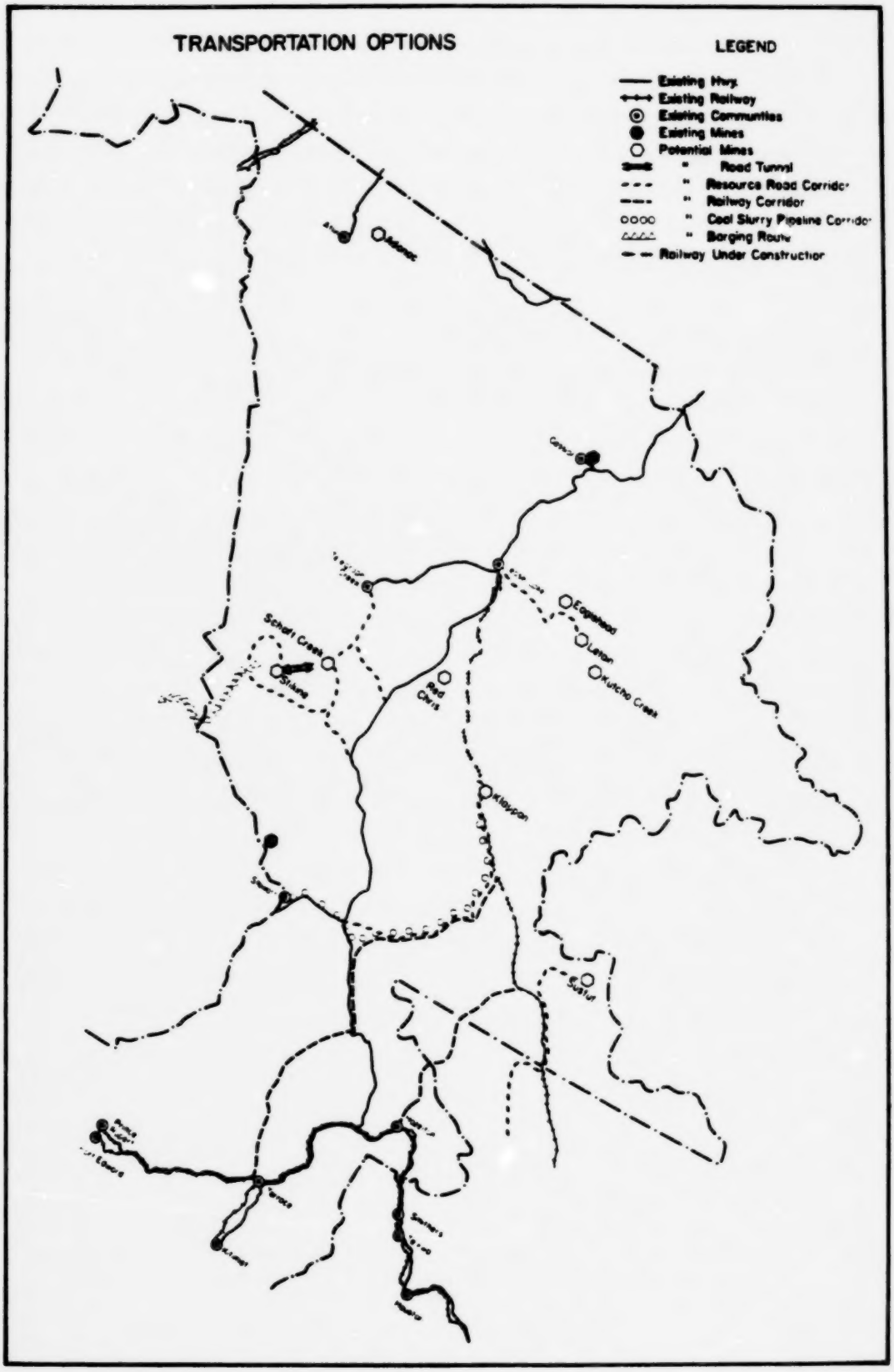

TRANSPORTATION OPTIONS
LEGEND
Existing Hwy
Existing Railway
Existing Communities
Existing Mines
Potential Mines
" Road Tunnel
" Resource Road Corridor
" Railway Corridor
" Coal Slurry Pipeline Corridor
" Barging Route
Railway Under Construction
Schaft Creek
Klappan
Kutcho Creek

Table 3.1 presents in 1982 dollars a summary of public and private sector capital costs associated with each transport alternative. Public road upgrading costs for the longer road haul to Prince Rupert were estimated to be $20 million higher than to Stewart. These higher capital costs and higher operating costs to Prince Rupert combined to rule out Prince Rupert as a cost-effective option.[1]

Table 3.2 presents both the capital and operating costs of each case in present value terms. The discounted capital costs are based on the actual costs shown in Table 3.1 and are discounted according to the proposed mine start dates.

The railway costs shown are those associated with a link from the BCR's Dease Lake Extension to the CNR at Hazelton, since that rail alternative was estimated to be the least-cost rail route when operating and rolling stock costs were also taken into account.

From the perspective of the economy as a whole, tentative results indicate the following:

- None of the cases investigated shows a definitive cost advantage over another. The present value of constructing and/or upgrading road and rail infrastructure in northwest B.C. and providing transportation services to the potential mines is estimated to be about $750 million in 1982 present value terms.

---

1 The private road capital costs include the incremental cost for employee road access to the Mount Klappan project.

- Given the dispersed geographical distribution of the potential mines and their differing transportation requirements, no single mode of transportation nor one corridor for transportation services would meet all mines' requirements. A multi-mode, multi-route transportation system will likely be required to serve the potential resource centres in Northwest B.C.

TABLE 3.1

Comparison of Transportation Cases
Estimated Capital Costs
(1982 $ millions)

Item	Case 1 (Road to Stewart)	Case 2 (Road/Rail to Prince Rupert)	Case 3 (Road/Rail to Stewart)	Case 4 (Road & Pipe-line)
Road (to Stewart)				
- Public	180	115	115	180
- Private	270	250	250	270
Railways				
New Construction & Upgrading				
- via P.G.	280	380	*	*
- via Vanderhoof	290	390	*	*
- via Hazelton	365	465	*	*
- via Meziadan	500	600	*	*
- to Stewart			470	*
Slurry Pipeline				
- to Stewart	N/A	N/A	N/A	360
Port Terminals				
- Stewart				
Concentrate	16	8	16	16
Coal	N/A	N/A	130	130
- Prince Rupert				
Concentrate	N/A	8	N/A	N/A
Coal	0	0	N/A	N/A

TABLE 3.2

Comparison of Transportation Cases
(Present Value 1982 $ Millions - 10% discount rate)

Item	Cost			
	Case 1 (Road to Stewart)	Case 2 (Road/Rail to Prince Rupert)	Case 3 (Road/Rail to Stewart)	Case 4 (Road & Pipeline)
Road				
. Construction & Maintenance				
- Public Highways	151	98	98	151
- Private Roads	71	77	79	71
. Transportation of Minerals	69	53	54	69
Rail				
. Railway Construction & Maintenance	227	292	290	N/A
. Rolling Stock	14	16	10	N/A
. Coal Transportation	164	164	80	N/A
. Other Minerals Transportation	0	12	6	N/A
Slurry Pipeline				
. Construction	N/A	N/A	N/A	223
. Operation	N/A	N/A	N/A	92
Port Terminals				
. Coal Terminal				
- Capital	0	0	72	72
- Operating[1]	20	20	35	35
. Other Minerals Terminal				
- Capital	13	13	13	13
- Operating	13	13	13	13
Total	752	758	750	739

Notes:

1) Assumes the actual operating cost (not including sunk capital costs) at Ridley Island port is $1.00/tonne.

Transportation of Minerals Other Than Coal

Table 3.3 summarizes the present value costs for each case when costs associated with coal traffic are not included in the comparison. The table shows that there are no significant differences in the shipping alternatives.

TABLE 3.3

Comparison of Transportation Costs (Excluding Coal Traffic)

(1982 Present Values, $Millions)

Item	Case 1 (Road to Stewart)	Case 2 (Road/Rail to Prince Rupert)	Case 3 (Road/Rail to Stewart)
Road			
Construction and Maintenance			
- Public Highways	151	98	98
- Private Roads	59	53	55
Transportation of Minerals	69	53	54
Rail			
Construction and Maintenance	N/A	65	65
Rolling Stock	N/A	2	3
Transportation of Minerals	N/A	12	6
TOTAL	279	283	281

Coal Transportation

The analysis indicates that, at a production level of five million tonnes per year, the least-cost transportation alternative for coal may be a railway from Mount Klappan to Stewart (Case 3), although the technical feasibility of this route has not been determined and construction costs may prove to be much higher than these preliminary estimates. The respective present value costs are shown in Table 3.4. Again, these costs must be regarded as preliminary and subject to change as engineering data on the feasibility and cost of constructing railways in the region become available.

Table 3.4 also shows that the construction and operation of a coal slurry pipeline (Case 4) between Mount Klappan and Stewart may have a slight cost advantage over rail transportation to Prince Rupert.

Recent discussions with Gulf Canada Resources Ltd., however, have indicated its preference for using rail transportation rather than pipeline for the following reasons:

(i) Engineering/technical constraints:

- Anthracite coal markets require the product to remain in large lumps whereas the transportation of coal in a slurry pipeline requires the coal to be ground into small particles.

- Pipeline capacities are largely fixed (i.e. by pipe diameter, etc.) and allow little flexibility once the facility is in place whereas railways offer more flexibility with respect to throughput because cars can be added to trains and more trains operated.

(ii) Environmental constraints (e.g. waste water may be a problem.)

(iii) Cost considerations (preliminary analyses do not indicate a definitive cost advantage for slurry pipelines vis a vis other modes).

For these reasons, it is unlikely that a slurry system will be considered further.

For a production level of between 1 and 2 million tonnes per year, it might be feasible to truck coal to Stewart. A brief analysis was carried out to estimate the relevant trucking costs. This preliminary assessment indicated that the 1982 present value of haul costs would be about $80 million via the Nass River to Stewart based on a haul distance of about 262 kilometres.

TABLE 3.4

Comparison of Transportation Costs for Coal Shipments

(1982 Present Value $ Millions)

Item	Case 2 (Rail to Prince Rupert)	Case 3 (Rail to Stewart)	Case 4 (Slurry Pipeline)
Road			
Construction and Maintenance*	24	24	24
Rail			
Rail Construction and Maintenance	227	225	---
Rolling Stock	14	7	---
Transportation of Coal	164	80	---
Slurry Pipeline			
- Construction	---	---	223
- Operating	---	---	92
Port			
Coal Terminal			
- Construction	---	72	72
- Operating	20	35	35
TOTAL (Rounded)	450	410	450

* Assumes No Road Cost Sharing With Sustut.

Note: Case 1 costs equivalent to Case 2 costs for coal alone.

Costs to Shipper/Commodity Rates

The future commodity rates offered by the railways and road haulers between the mines in Northwest B.C. and tidewater will be important determinants of the economic feasibility of potential mines, the modes of transportation selected and the routes used between mines and tidewater. This pre-feasibility analysis has concentrated upon the development of costs for road and rail infrastructure and services, rather than upon the development of commodity rates. However, if it is assumed that

the unit costs developed for transportation of commodities in this analysis are used as the basis for rate setting, comparisons of alternatives facing the shipper can be made based on these costs. In the case of rail, commodity rates are based on rail construction costs as well as operating costs and rolling stock requirements. Road haul rates, on the other hand, do not reflect road construction costs but do include the rolling stock capital and operating costs. These factors are taken into consideration in the following comparison of unit costs likely to form the basis of rates facing the shipper.

Table 3.5 below compares unit costs for the shipment of products from seven of the mines in Northwest B.C. to tidewater.

TABLE 3.5

Unit Transportation Costs; Mines to Tidewater
($/tonne)

Mine	Case 1 (Road to Stewart)	Case 2 (Road/Rail to Prince Rupert)	Case 3 (Road/Rail to Stewart)
Kutcho Creek	$29.30	$58.10	$51.50
Letain	26.90	50.60	45.30
Eaglehead	26.50	51.10	45.70
Red Chris	18.30	34.30	29.70
Schaft Creek	16.80	16.80	16.80
Sustut	20.40	14.20	17.42
Stikine	26.90	26.90	26.90

As noted above, the unit costs do not include private or public road construction costs since these would not be the responsibility of the trucking company, other than through

licence fees which are included. On the other hand, rail construction costs are included in the rail unit costs for Cases 2 and 3. Combined road-rail costs were not prepared for Stikine and Schaft Creek since the road-rail options in these cases would involve considerable, extra haul distances to tidewater and inter-modal transfers.

The table shows that the least-cost case would be Case 1, again suggesting that road transport to Stewart would be the preferred option except for Sustut. Because of Sustut's location, rail transport to Prince Rupert would be the least-cost option.

It is assumed that commodity throughput costs at a port in Stewart would be similar to those at a terminal in Prince Rupert (i.e. about $15/tonne) and that the extra ocean shipping cost from Stewart would be a relatively insignificant $0.60/tonne.

The total cost comparisons shown in Table 3.4 indicate that a rail route to Stewart (Case 3) may be the least-cost option to transport 5 million tonnes of coal from Mount Klappan to tidewater. The unit cost of this case is estimated to be about $14/tonne, excluding port handling charges. By comparison, the unit costs in Cases 2 and 4 are estimated at $18.30 and $14.50 respectively.

The analysis on port alternatives indicates that terminal rates at the Ridley Island port would be about $4/tonne and, at Stewart, they are estimated at $10/tonne for a new 5 million tonne terminal. Thus, when taking port and haul costs into consideration, no definitive cost advantage can be identified for transporting coal by rail through Stewart or Prince Rupert, although overall, rail to Prince Rupert may be slightly less because of lower port handling costs.

Unit costs for trucking 1 million tonnes of coal to Stewart were estimated to be between $21 and $26/tonne in 1982 dollars.

As noted previously, detailed engineering feasibility and cost studies are required to further evaluate the preceeding tentative conclusions.

Summary of Transportation Conclusions

While it must be stressed that the work done so far is merely a pre-feasibility analysis based on a possible mine production scenario, three principal conclusions have been reached.

1) From two perspectives (total public and private costs and mine-shipper costs), the preferred (least-cost) option for the transportation of concentrates and asbestos would be via road to Stewart for export. This would involve upgrading Highway 37 as well as constructing new mine access roads (estimated net present value of $279 million for all potential mines considered).

2) From the same two perspectives, the preferred option for the transportation of coal would be by rail. A new rail route to Stewart may be the least cost option (estimated net present value of $410 million) but the analysis on this route was conducted without the benefit of any engineering feasibility studies. Further, construction of a coal terminal at Stewart may prove technically difficult and more costly than indicated here. The next least-cost rail route, a connection to Hazelton, may in fact be the preferred option at a mine production of five million tonnes per year. This would involve upgrading part of the BCR Dease Lake Extension between Mount Klappan and Suskeena and the construction of a new rail route between Suskeena and Hazelton which is on the CNR Northline.

3) Even under the most optimistic assumptions regarding potential mine outputs and backhaul traffic to the mines, an extension of the railway from Mount Klappan to Dease Lake does not appear to be economically feasible.

4. ENERGY OPTIONS

B.C. Hydro examined options for supplying power to nine potential new mines and two existing mines in Northwest B.C. The study proceeded on the basis of the development scenario noted earlier. Some analysis was also conducted allowing for more flexible start-up dates. In many cases, the results were not significantly different unless start-up dates are delayed until power from the potential Stikine/Iskut Hydro electric project is available.

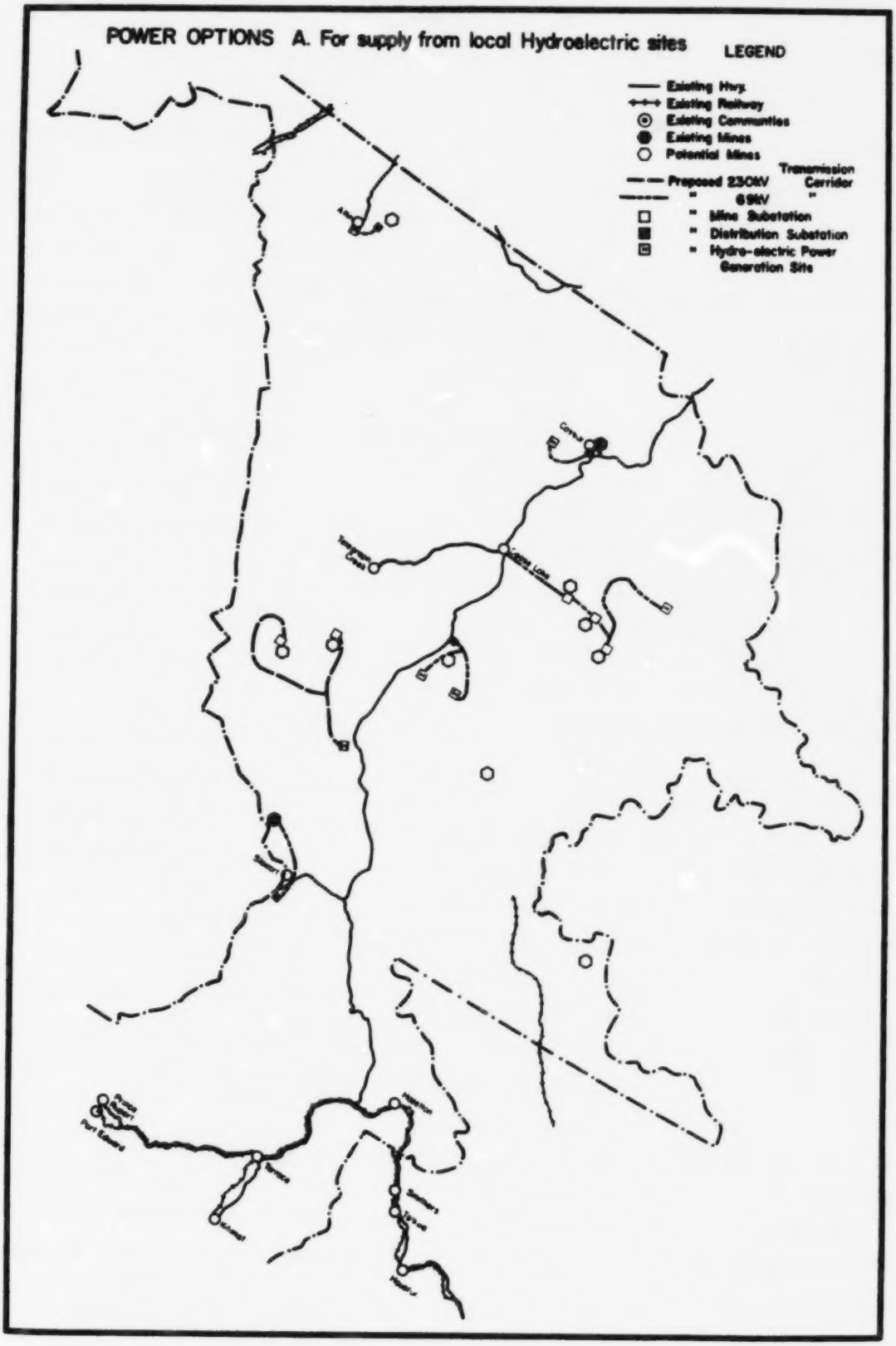
Four power supply options were considered:

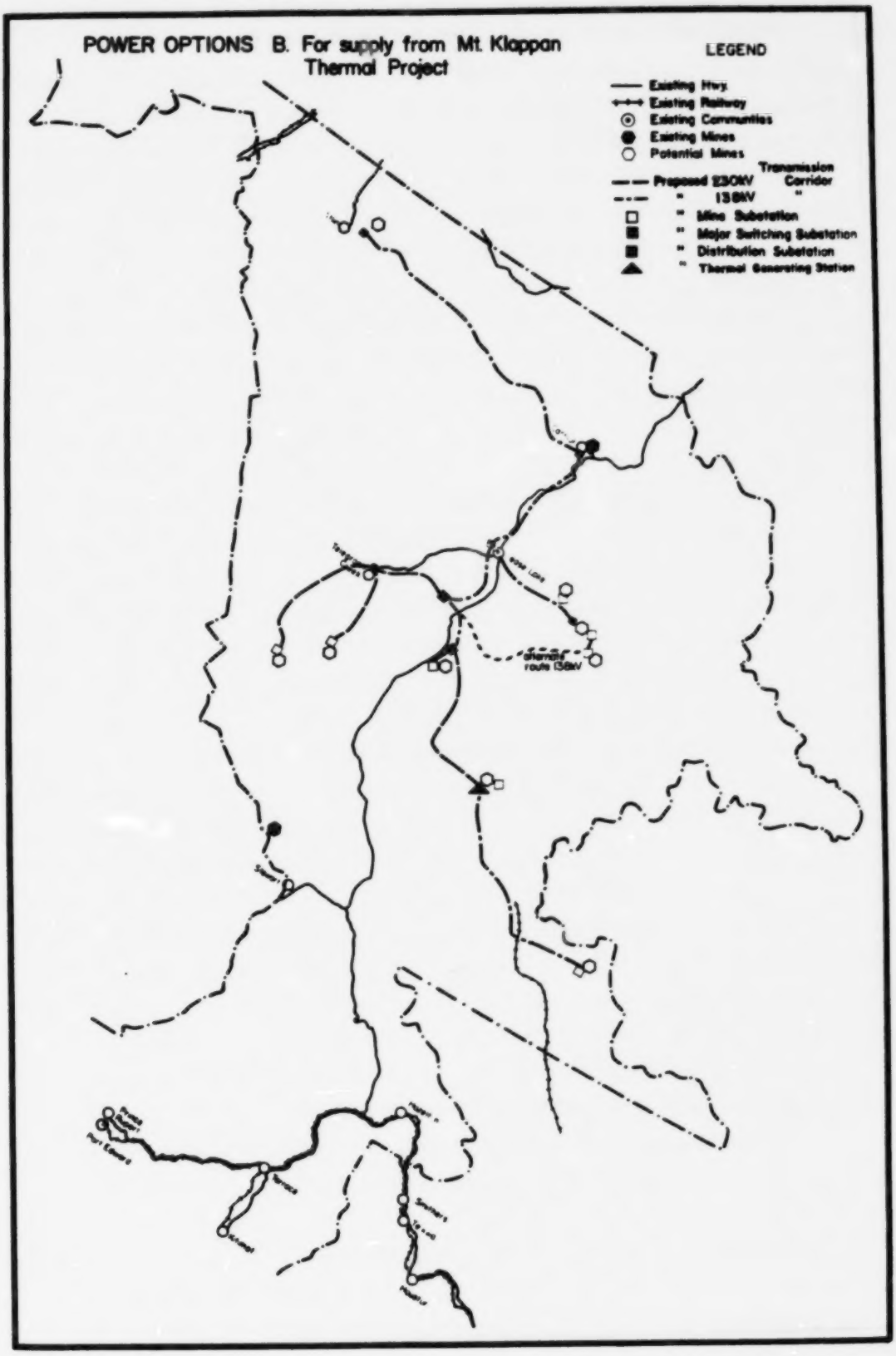
a) extensions from B.C. Hydro's grid;
b) energy supply from a coal-fired thermal plant at Gulf Canada Resources' Mount Klappan property;
c) hydro generation near mine sites (More Creek for Schaft Creek and/or Stikine copper and small hydro, where identified, for other mines); and
d) diesel generators at mine sites.

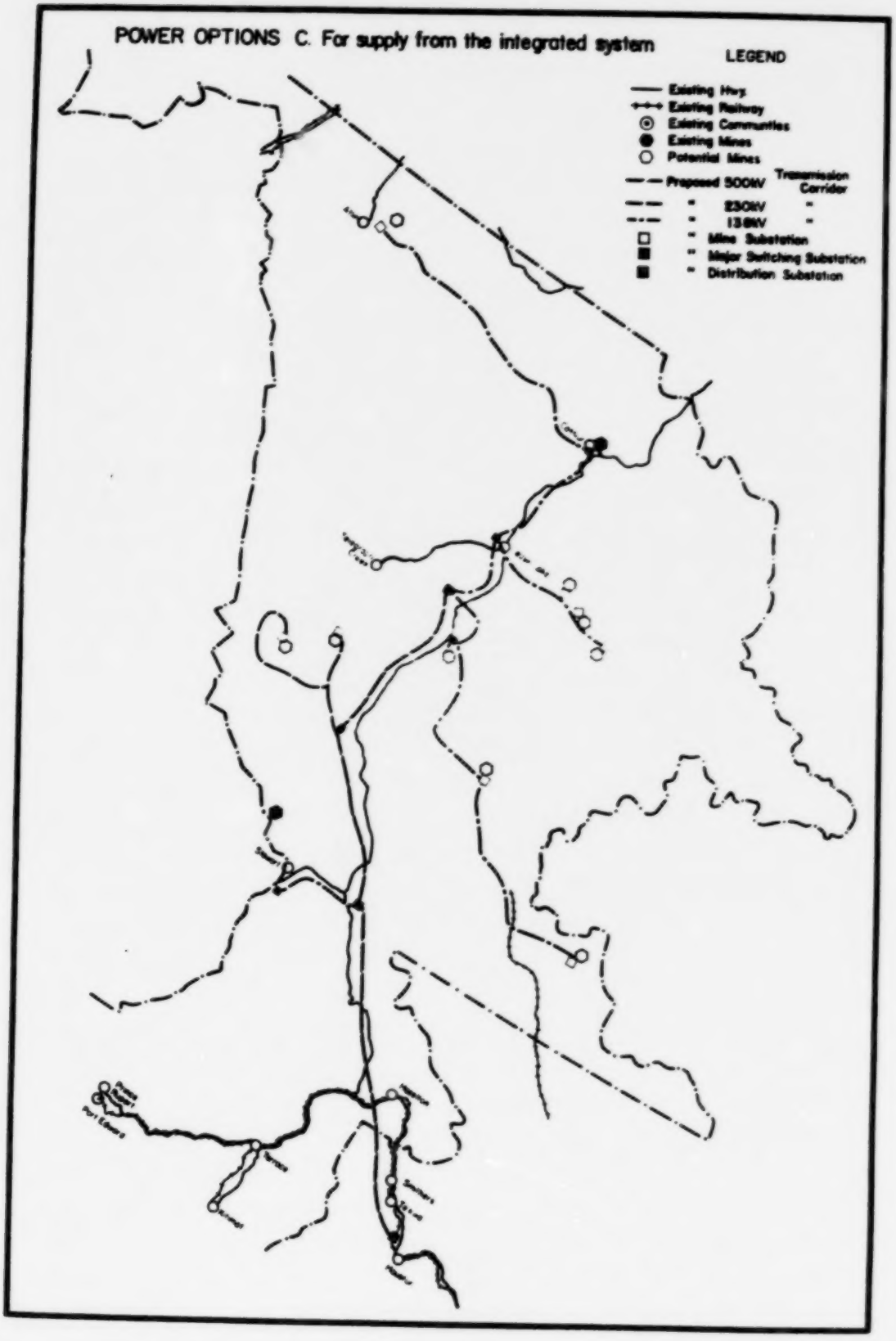
Since B.C. Hydro is investigating the viability of a major hydro-electric development consisting of four projects on the Stikine and Iskut rivers, the cost of supplying power from the B.C. Hydro grid and the cost of building More Creek are examined under three different development scenarios:

a) no Stikine/Iskut project;
b) electricity from the Stikine/Iskut in 2000; and
c) electricity from the Stikine/Iskut in 1995.

For the purpose of this study, it was assumed that all prices would remain constant in real terms. The estimates with respect to the diesel options are based on the average price for diesel fuel paid by B.C. Hydro in Northwestern B.C. in October 1982.


POWER OPTIONS A. For supply from local Hydroelectric sites
LEGEND
Existing Hwy.
Existing Railway
Existing Communities
Existing Mines
Potential Mines
Transmission Corridor
Proposed 230kV
" 69kV "
" Mine Substation
" Distribution Substation
" Hydro-electric Power Generation Site


POWER OPTIONS B. For supply from Mt. Klappan Thermal Project
LEGEND
Existing Hwy
Existing Railway
Existing Communities
Existing Mines
Potential Mines
Transmission Corridor
Proposed 230KV "
" 138KV "
" Mine Substation
" Major Switching Substation
" Distribution Substation
" Thermal Generating Station
thermal route 138kV


POWER OPTIONS C. For supply from the integrated system
LEGEND
Existing Hwy
Existing Railway
Existing Communities
Existing Mines
Potential Mines
Proposed 500kV
" 230kV
" 138kV
Transmission Corridor
" Mine Substation
" Major Switching Substation
" Distribution Substation

Results of the study show that under each Stikine/Iskut development scenario, there is no single preferred option for all the mines in the Northwest. This is particularly true because the analysis is done assuming fixed start-up dates for the nine potential new mines. The average energy cost of some power options is biased upward for mines where supplemental diesel operation is required because the start-up date of the mine precedes the earliest feasible in-service date for another source of power such as the potential Stikine/Iskut power project. Thus, if mine start-up is sensitive to power costs, it may be advantageous for some mines to delay production until after the Stikine/Iskut project proceeds.

This is not to suggest that a decision on the Stikine/Iskut can be based on mine development in the Northwest. Such a decision must be based on future provincial energy demand, including the potential Northwest B.C. demand, possible export demand and the successful negotiation of international agreements.

The results of this analysis are discussed below on a mine-by-mine basis.

Mount Klappan

On-site coal-fired thermal generation is likely to be the least-cost power option for the Mount Klappan anthracite coal project. B.C. Hydro has estimated that capital costs for this option would fall between $1220 and $3300/kw and operating costs would be around 20 mills/kwh (1982). Where within this range the actual capital costs fall, determines to what extent coal-fired thermal is the preferred option.

If the in-service date of the mine is delayed until power becomes available from Hydro's Stikine/Iskut project, then an extension from that development may be the preferred option but only if the cost estimates for

the thermal plant tend towards the top end of the estimates.

Kutcho Creek

For Kutcho Creek and the other two nearby mines (Letain & Eaglehead), the choice of the least-cost power option can not be determined unequivocally, since the best option is dependent upon:

1) the order of magnitude of costs for a coal-fired plant;
2) the number of mines which share transmission facilities;
3) the schedule of mine start dates; and
4) the availability of power from the Stikine/Iskut project.

If costs for the coal-fired thermal power plant are near or below the middle of the cost range estimated by B.C. Hydro, then thermal power would be the preferred option for Kutcho Creek as well as Letain and Eaglehead. For Kutcho Creek, though, since it is likely go into production prior to the start of Mount Klappan, diesel power will be required until thermal is available. If the costs for thermal power tend towards the high end of the range, then diesel would be the preferred option for each mine provided that the Stikine/Iskut project does not precede the start-up of these mines. If Stikine/Iskut power is available, the average energy cost from it would be lower than the next best alternative for each mine.

Stikine Copper

If the start date for Stikine copper is coincident or later than development of the Stikine/Iskut, then extensions from the Bob Quinn substation and power from the Stikine/Iskut project would be by far the least-cost power option. If the mine was to open prior to

Stikine/Iskut power being available, then More Creek power shared with Schaft Creek would be the preferred option. If Stikine were to proceed and Schaft Creek did not, then More Creek for Stikine alone would be the best option only at discount rates of 10 and 12 percent. At a lower discount rate, diesel would be the preferred option for Stikine.

Schaft Creek

Advanced construction of the More Creek dam site appears to be the least-cost power option for Schaft Creek. The cost of constructing the More Creek dam as a stand-alone project is estimated to be in the order of $250 million 1982 dollars. However, it should be noted that More Creek can only provide an average of about 700 Gwh of energy annually. Schaft Creek will require about 560 Gwh annually, thereby limiting the availablity of surplus More Creek energy substantially. To supply another mine such as Stikine, which requires 385 Gwh of energy annually, supplemental diesel would be required to make up the shortfall.

If the Stikine/Iskut project does not proceed and More Creek is shared by Stikine and Schaft Creek, then an extension from the coal-fired thermal plant at Mount Klappan may be a better option than More Creek, but only if the cost of the coal-fired thermal plant is at the low end of Hydro's cost estimate.

Red Chris

The proximity of the Red Chris mine to Mount Klappan tends to make the coal-fired thermal option the better alternative for that mine if the mid-point (or lower)

cost estimates for coal fired generation are accurate. Even if costs tend towards the high end of the range, the thermal option appears best at low discount rates. If Stikine/Iskut power is available by 1995, then either diesel or an extension from the grid becomes the least-cost option.

Letain and Eaglehead

The least-cost power option for these two mines will likely be the same as the best option for Kutcho discussed above.

Adanac

Again, transmission costs to Adanac tend to rule out any option other than diesel or remote hydro. There is a good small hydro site near this property which, when supplemented with diesel, would be the least-cost power option.

Sustut

Diesel generation appears to be the least-cost option at Sustut under all scenarios and irrespective of timing, assuming that the cost of coal-fired thermal generation at Mount Klappan is not lower than the range of costs estimated by B.C. Hydro. Further, because of the remoteness of Sustut, an extension from the potential Stikine substation (assuming the Stikine/ Iskut project is in place) would only benefit Sustut if Mount Klappan bears most of the cost of transmission from Stikine to Mount Klappan.

Cassiar

The cost of transmission north of Dease Lake alone exceeds the cost of generating power at or near Cassiar. Therefore, notwithstanding the possibility of extending transmission facilities southward from the Yukon to Cassiar, it appears that under all scenarios, diesel at Cassiar will continue to be the least-cost power option.

In summary, there is no single preferred energy option for power supply in Northwestern British Columbia from within the region. Advanced construction of transmission lines from Telkwa to the mines was also considered but, because of the high cost of transmission, this is not an economic option.

Diesel operation is preferred to small hydro as an on-site source of electricity. The exception in this study was Adanac, where a particularly favourable hydro site was identified. However, if the cost of a coal-fired thermal plant falls in the mid-range estimate or below, that source becomes the preferred option for Red Chris and the mines in the Kutcho Creek area if they all share the transmission costs.

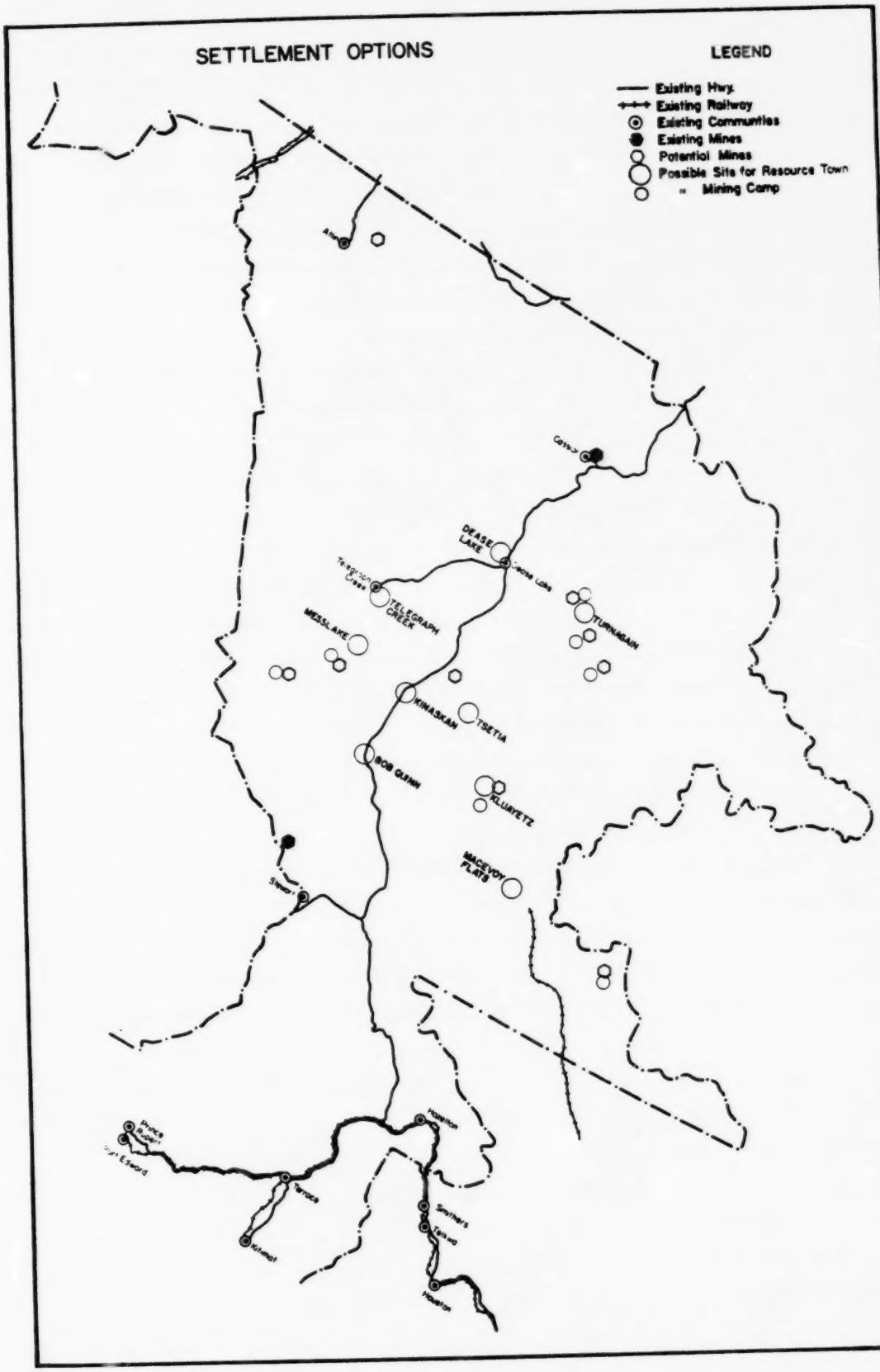
Power from a central coal-fired power plant at Mount Klappan becomes more attractive as the in-service date of the Stikine/Iskut project is deferred. However, a coal-fired power plant at Mount Klappan is unlikely to be a cost-effective power option for Adanac, Cassiar, Schaft Creek, Stikine copper or Sustut.

5. SETTLEMENT OPTIONS

Two factors constrain the choice of settlement options in the region. First, mining prospects are geographically widespread throughout the region, creating substantial difficulties in serving more than one development from any given location. Second, the present population of the area is widely dispersed. Existing communities are very small and poorly located to serve the potential resource developments on a daily commuting basis. The various options for each potential mine are discussed below.

The Mount Klappan coal project is well beyond an acceptable daily commuting distance to any existing community in the region. The nearest communities are Iskut and Eddontenajon, fully 113 km to the north and the west. At a production level of 5 million tonnes per annum, projected employment is 1250 persons. This workforce could support a town with a population of approximately 3,000 and should be adequate to support an acceptable level of services in a new community at reasonable per capita costs.

Two possible new townsite locations were evaluated. The first, "Kluayetz", would be located very near to the minesite at the intersection of the Little Klappan, Skeena and Spatsizi Rivers. The second, "Tsetia", would be located 58 kilometres north of the minesite along the B.C.R. sub-grade. A third site located 58 kilometres south of the minesite at MacEvoy Flats was suggested by regional resource agency reviewers. This site was not subject to detailed evaluation but appears very promising from a preliminary perspective.


SETTLEMENT OPTIONS
LEGEND
Existing Hwy.
Existing Railway
Existing Communities
Existing Mines
Potential Mines
Possible Site for Resource Town
Mining Camp
DEASE LAKE
TELEGRAPH CREEK
MESS LAKE
TURNAGAIN
KWADACHA
TSETIA
BOB GLENN
KLUAYETZ
MACKENZIE PLATS
Prince Rupert
Terrace
Kitimat
Smithers
Houston

The Tsetia site appears superior climatically. The area is warmer with lower snowfall and a longer growing season. On the other hand, Tsetia is relatively isolated. It is a long commuting distance to the minesite and, of all the options, is furthest removed from major population centres in the south. Also, it is not well located to serve other potential coal developments in the region. Both Tsetia and Kluayetz are located in areas of high environmental sensitivity due to their proximity to the Spatsizi Wilderness Park. Overall, the Tsetia site is of greater concern because it implies an access route running parallel to the park for a considerable distance.

The potential site at MacEvoy Flats has a number of potential advantages. While it would involve a commuting distance to the minesite similar to the Tsetia option, it is located closer to major communities in the south thereby reducing isolation. MacEvoy Flats may also avoid the potential land use problems inherent in the other two locations because of their proximity to Spatsizi Park. It is at least as attractive as Kluayetz in terms of servicing other potential coal developments in the area. It may also have the potential to serve the Sustut copper prospect, a further 69 kilometres to the south.

Sustut has a short projected mine life and a relatively small projected labour force of 350 persons. On its own, this prospect does not justify a townsite option. However, it could play a valuable role as an addition to a Mount Klappan townsite, by providing some diversity to a new community's economic base.

The three potential mines east of Dease Lake (Eaglehead, Letain and Kutcho Creek) are all relatively close to each other and can be considered together. The nearest

existing community to all three is Dease Lake on Highway 37 which is 84 kilometres from the nearest prospect (Eaglehead) and 129 kilometres from the most distant (Kutcho Creek). Dease Lake is a small community with a total 1981 population of 237. While the present residents would probably welcome new mine developments as a source of employment, existing services have little or no excess capacity. Also, the site itself has problems due to the variability and complexity of the geography and consequent uncertainty in building conditions. Finally, the distance from the potential mines is beyond a comfortable daily commute, particularly in the case of Kutcho Creek. Overall, Dease Lake has few advantages to offset these disadvantages.

A new community, "Turnagain Town", was investigated as an option to serve all three prospects. The major problem with a new community arises from the relatively short life span of all three prospects and the relatively small labour force involved with each. If all three mines were to begin operation simultaneously, the estimated population of Turnagain Town would be 2600 persons. This total is marginal in terms of supporting a level of services conducive to attracting and retaining a stable workforce. Furthermore, based on existing information, it appears this population could only be sustained for 11 years until the Kutcho Creek property was exhausted. This short life span and the uncertainty regarding future mineral developments makes it difficult to justify a new community which would require public and private sector investment. All of this would negatively impact on the "liveability" of the community. Moreover,if the mines begin operations at different times, this problem would be more severe and the potential population would not justify a new town.

Both daily and block time air commute options from Terrace were examined for the preceding three properties. A daily commute would require an estimated 1 hour and 30 minutes each way and cost an estimated $63 per worker return. Both the

expense and time involved would probably rule out this option. A block time commute could probably offer distinct advantages by reducing commuting costs and offering the greatest flexibility. Either commute option would present the least financial risk to the public sector.

Schaft Creek is one of the larger potential mines in the area with a projected labour force of 1200. The nearest existing community is Telegraph Creek, 71 kilometres to the north. As with Dease Lake, this is a small settlement with a 1981 population of 270. The majority of the population is Tahltan Indian, who have an unresolved land claim on the area. A number of physical factors constrain expansion of Telegraph Creek. The topography, flood hazard, and slope stability are all potential problems. Finally, the community is poorly located for mine development if road haul proves to be the preferred mode of transporting mine output. Access to the minesite via Telegraph Creek would add considerable distance to any road hauls.

Three possible new townsite locations were examined as potential settlement options for Schaft Creek. The first was "Kinaskan", located on Highway 37 at the south end of Kinaskan Lake. One advantage of this location is its potential to serve as the residential base for the Red Chris prospect. The community would be located only 32 kilometres from Red Chris and 64 kilometres from Schaft Creek. With both mines operating, the projected population of 3700 persons would be sufficient to support an acceptable level of services at reasonable per capita costs. There would be definite advantages in avoiding dependence on a single employer. Also, this potential townsite is located in a high quality tourist area and consequently offers a good prospect for further economic diversity. On the other hand, a major disadvantage is the potential difficulty in winter

associated with commuting over Raspberry Pass to the Schaft Creek minesite. Also, the road between the townsite and the mine would necessarily traverse Mount Edziza Park, creating potential land use conflicts.

Another potential townsite location at Bob Quinn Lake, further to the south, retains the strategic advantage of location on Highway 37. This site, however, could not serve the Red Chris property. On the basis of Schaft Creek alone, a projected population of 2800 would imply a considerably lower level of services. The distance to Schaft Creek is approximately 77 kilometres, somewhat longer than from Kinaskan and the trip through the More Creek Pass area would be equally difficult in winter. Also, there is a possible conflict with power supply for the area since a More Creek hydro electric project would flood much of the access route.

A third option is to locate a townsite in the "Mess Lake" area close to the Schaft Creek property. This would reduce the daily commute to approximately 26 kilometres. As with the Bob Quinn Lake site, Red Chris could not be served from this location. Also, being somewhat distant from the Highway 37 corridor would eliminate future economic diversity opportunities arising from tourism. The potential land use problems associated with Edziza Park would remain if access to the site was via Raspberry Pass and, due to the townsite's proximity to the Park, more significant localized effects could be expected. A Mess Lake townsite could serve the Stikine copper property but only by accessing Stikine via a 32 kilometre tunnel through a mountain range. The feasibility is questionable and the costs would undoubtedly be immense.

If the Kinaskan townsite is rejected, then the options for the Red Chris prospect require evaluation on their own. The projected workforce of 375 is too small to justify a new town. A daily air commute from the south is similarly out of the

question. Travel time to and from Terrace is estimated at 1 hour and 42 minutes each way at a cost of approximately $55 return. A block time commute may be the only reasonable option to serve this minesite.

Similarly, if the Mess Lake townsite is rejected or if tunnelling proves technically or economically impractical, any potential townsite to serve the Stikine copper prospect alone would be very small, highly isolated and poorly serviced. Both daily and block time commuting options also appear unattractive in the case of Stikine. The minesite is located at a considerable distance from potential airports, necessitating travel that would be both high cost and very time consuming.

6. SOCIAL IMPLICATIONS

Preliminary projections of the supply and demand for labour associated with potential mine projects indicate that the demand for manpower would far exceed the supply in the northwest, resulting in significant in-migration to the region. A large influx of newcomers as a result of mine developments would have major implications for labour force and community stability in the Northwest.

The area under consideration has one of the lowest population densities of any area in the province. The population is rural and predominantly native Indian. A wage economy has made only limited inroads into the area which is dominated by subsistence and independent commodity production; the former is, for the most part, native food fishing and hunting, the latter, mainly trapping and guide-outfitting. As a consequence, any impacts on the fish and wildlife resources resulting from mine developments will have a ripple effect on the economic base of the resident population.

Impacts from development on fish and wildlife resources in the region are potentially significant. These impacts will have socio-economic implications for the Tahltan, Gitksan-Carrier and Nishga people through impacts on the food fisheries. Impacts on salmon stocks would also affect the commercial coastal fishery. Also significant are the potential impacts on game stocks upon which a proportion of the Tahltan Indian population depend for their food supply.

The positive impacts of employment opportunities are potentially most dramatic for the small established communities in the area where unemployment and underemployment are chronic

problems. The Association of United Tahltans estimated unemployment for the Iskut Band to be 80 per cent and to be 95 per cent for Telegraph Creek residents in 1982. The accessibility of mine employment to residents in these northern communities would depend on the settlement option selected for housing the workforce. In most cases, existing communities are not within daily commuting distance of minesites. This would indicate that, for some residents, the opportunity of participating in a mine workforce might involve either relocation to a new town or, possibly, a block time commuting arrangement.

Development in Northwest B.C. could result in an intensification of discussions between government and local Indian representatives on the issue of land claims. The federal government has accepted, in principle, that the land claims of the Nishga, Kitwancool, Gitksan-Carrier, Haisla and United Tahltans have some validity and are worthy of negotiation. The Kaska-Dene land claim is currently under review. Social agency reviewers have pointed out that the relevant native Indian groups wish to be involved in the planning process of northwest development. This would likely also include those groups whose land will be affected by linear developments as well as the land where mine projects might be located.

A preliminary social adaptability analysis indicates that the population impacts associated with the mine development scenario would likely overtax the resources of the small communities in the vicinity of mine projects if these towns were targeted as staging areas for housing mine workforces. It is anticipated that the regional centres in the south along Highway 16 are much more able to incorporate the mine development workforce and associated population without serious disruption. A number of these communities have economies based on relatively well-developed industrial, commercial, and service sectors where wage employment is the norm. In many respects, the added

population and employment opportunities would serve as a stimulus and source of economic diversification for all of these communities. While there may be physical limits to the residential expansion capabilities of Prince Rupert, Terrace, Kitimat and Smithers, these communities are not anticipated to have any serious difficulties accommodating the additional population. Most social services in the regional centres currently are operating with excess capacity and could be expanded if the need arises.

The settlement options evaluated fall into three categories:

1) expanding existing communities in the northernmost part of the region (i.e. Stewart and north);
2) developing new towns in relatively close proximity to minesites; and
3) locating workforces of mine projects in regional centres and commuting workers to minesites on a block-time rotation basis, along with a supplemental commuting stream involving residents of the northernmost communities.

The three options are not necessarily mutually exclusive. It is possible that long-distance block commuting may be technically feasible for some mine projects but not for others. Furthermore, the development of a new town to service a particular project does not preclude the use of daily and/or block-time commuting from small, predominantly native Indian communities. Block-time commuting is an attractive option in that it could provide positive benefits to regional centres along the Highway 16 corridor as well as to the smaller communities in the northern area. At the same time, block-time commuting from regional centres is the option which would place the least pressure on the fish and wildlife resources of the region.

7. ENVIRONMENTAL AND LAND USE IMPLICATIONS

Given the absence of regional inventory information and the conceptual nature of project proposals, the possible advantages and disadvantages of individual development proposals have only been highlighted at this time. Consequently, few options can be categorically endorsed or ruled out. Any judgement of acceptability of the development proposals will require more detailed baseline information and more advanced project designs. Bearing these qualifications in mind, the following general conclusions are drawn.

Resource Implications of Major Mineral Developments

If major mineral developments proceed, a widespread increase in resource management tasks and responsibilities in the Northwest is predicted. At present, very little of the Province's resource management effort is expended in the area. To cope with the major proposed developments, additional management capability would be required.

The Settlement Options

Generally, from an environmental perspective, mining camp options seem to be favoured over town development options for all mines, primarily because the camps would be less likely to be associated with major, long-lasting off-site impacts. If town development were selected for the Mount Klappan Coal Project, a townsite south of the minesite would be preferred to minimize impacts on Spatsizi Park. Similarly, for the Schaft Creek copper/molybdenum Project, the expansion of Bob Quinn Lake would be preferred to minimize impacts on Mount Edziza Park. Town development in the Turnagain drainage area would not likely be favoured.

The Road Access Options

Most of the road access proposals can probably be located along environmentally acceptable alignments within their respective proposed corridors. The More Creek corridor would likely be preferred for road access to the Schaft Creek mine, even if the valley is eventually flooded by B.C. Hydro. The Province would have to consider various options for its involvement in the development of an adequate road access between Dease Lake and the Kutcho Creek minesite, since the present track is in very poor condition. It would also have to carefully weigh the benefits and costs of road development along the Iskut Valley to the Stikine River. Superficially, at least, a road in this valley would appear to have resource development advantages.

The Power Supply Options

Local hydro-electric or diesel generated power schemes are likely to be the environmentally preferred means of providing power to the various minesites, primarily because of the flexibility to stage power projects and also because transmission line development is minimized. The latter considerations are drawbacks of the other major regional power supply options (a link to the integrated grid or development of a thermal plant at Mount Klappan as a potential power source for other projects). Thermal power supply also raises air quality concerns. The feasibility of proceeding with the More Creek dam without some or all of the other components of the Iskut-Stikine power proposals would have to be explored with B.C. Hydro. Assessment of local hydro-electric power supply options would be needed for the Sustut mine, since power from the More Creek dam would necessitate a very lengthy transmission line.

The Railway Options

A rail link to Stewart via the Bear Pass would likely prove to be technically infeasible. Environmental routing concerns would have to be carefully addressed relative to all railway proposals.

Summary

The proposed major developments would have important implications for provincial environmental resource management programs in the area north of Stewart. Among the more important issues which would require attention are:

- more precise definitions of development proposals;
- more precise definitions of study areas for resource inventory programs related to the major developments;
- the undertaking of appropriate strategic resource planning activities in advance of the major development thrust;
- consideration of preferred corridors for linear development;
- regional and site-specific impact concerns of agencies involved in the management of wildlife resources, fisheries resources, agricultural resources, recreational and aesthetic resources, and heritage resources;

8. CONCLUSIONS

The economic analysis of the mineral potential in Northwest British Columbia indicates that mine developments will likely be phased in over a considerable time period. The analysis suggests that the Kutcho Creek copper/zinc property, the Mount Klappan anthracite coal property, the Stikine copper property and the Schaft Creek copper property are the only properties likely to come into production prior to the year 2000. All of these properties are widely separated by vast distances and rugged terrain, making a common set of support facilities largely impractical.

Given this situation, three sub-regions seem to emerge as areas which can be planned in relative independence. These regions centre on the mine developments noted above. The key findings for each area are summarized below.

Kutcho Creek Resource Area

The Kutcho Creek resource area includes three potential larger mines and a number of smaller mineral deposits. The three larger mines are the Kutcho Creek copper/zinc deposit, the Letain asbestos deposit and the Eaglehead copper deposit. Kutcho Creek is likely to proceed prior to early 1990. However, Eaglehead may be delayed until the late 1990's while Letain is unlikely to be developed prior to the year 2000. The other smaller mineral deposits in the area will be gradually developed over the next twenty years.

The transportation study indicates that road transportation to Stewart is the preferred means to transport concentrate shipments from all of these prospects. For this, a 110 kilometre resource road from Dease Lake to the mine and some incremental upgrading of Highway 37 would be required.

Initially, onsite diesel electricity generation would be the lowest cost power option at Kutcho Creek. Coal-fired thermal generation from Mount Klappan could eventually provide lower cost power in the longer term, if additional mines begin production.

A new community in this area is unlikely to be a viable proposition due to small work forces and the short life of all the potential mines. Commuting workers from established communities along the Highway 16 corridor and other established communities is the preferred settlement option.

Mount Klappan Resouce Area

The Mount Klappan anthracite coal project is likely to come into production towards the end of this decade. The developer, Gulf Resources Canada Ltd., has discussed both a low production scenario of 1-2 million tonnes of high quality product and a high production scenario of 5 million tonnes of average quality product, but final production plans will depend on market conditions.

For low production levels, road transport to Stewart appears to be the lowest cost transport option. One of two road options could be chosen, either a new route to Stewart which would be capital intensive or a lower cost route which would follow the existing BCR subgrade about 100 kilometres north and incorporate a 50 kilometre connection to Highway 37.

At low production levels, commuting workers from established communities appears to be the favoured settlement option since the employment levels would not likely merit a new town.

At the high production level, rail transport to Prince Rupert via a new 195 kilometre connector between the BCR and the

CNR at Hazelton would appear to be the preferred transportation alternative. In addition, employment of about 1200 people for the mine operation could justify the construction of a new townsite.

For the high production scenario, a coal-fired power generating station would likely be the least-cost source of electric power for this mine operation.

Schaft Creek/Stikine Resource Area

This area contains two potentially large copper deposits. While the precise timing of these developments is uncertain, they could reach production by the year 2000.

Road transport to Stewart appears to be the lowest cost option for concentrate shipments in the case of Schaft Creek. Three alternative routes are potentially available and each could be considered although a route through Mount Edziza park (Raspberry Pass) would be the shortest.

Road access to the Stikine property poses severe financial and engineering problems because of the extreme topography. Export through Alaska may prove to be the lowest cost option.

For power supply, More Creek could be developed as a stand-alone hydro project to serve Schaft Creek and/or Stikine Copper. While this option appears to be the lowest cost, if both projects proceed, supplemental diesel generation would be required since More Creek does not have enough capacity to serve both mines.

A new community would likely be justified for Schaft Creek since existing communities in the vicinity do not appear suitable and the workforce would be quite large. One of the possible sites for Schaft Creek could also serve Stikine but only if serious access problems could be overcome.

Development Strategy

These three specific areas should be the focus of continuing development planning and of further discussion and study with respect to the preliminary findings. In particular, further analysis should be focussed on the question of resource road alternatives for the three areas and rail access for the Mount Klappan area. Additional analysis is also necessary to finalize the settlement options and the energy supply options for these regions. Since the baseline environmental data for the whole of the northwest is limited, further effort to improve that data base is required.

Much of this work will be the responsibility of private sector developers, but the government may assist to ensure that an integrated planning program is continued in order to facilitate the timely development of the economic potential in the Northwest.

Queen's Printer for British Columbia ©
Victoria, 1983

POOR

QUALITY

ORIGINAL